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Substance misuse in life and death in a two-year cohort of suicides

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Abstract

Background

While substance misuse is a key risk factor in suicide relatively little is known about the relationship between lifetime misuse and misuse at the suicide.

Aim

To examine the relationship between substance misuse and subsequent suicide.

Method

Linkage of Coroners' reports to primary care records for 403 suicides occurring over two years.

Results

With alcohol misuse 67% of the cohort had previously sought help for alcohol problems and 39% were intoxicated at the suicide. With misuse of other substances: 54% of the cohort was tested. Almost 1 in 4 (38%) tested positive, defined as an excess of drugs over the prescribed therapeutic dosage and/or detection of illicit substances. Those tested were more likely to be young and have a history of drug abuse.

Conclusion

Improving our understanding of the role of substance misuse as a risk factor in suicide is discussed alongside current pathology and coroner practices.

Declaration of interest

None

Background

Effective suicide prevention initiatives rely on identifying factors involved in vulnerability and risk and provide opportunities for intervention. While addiction and misuse of alcohol, prescriptions and illicit drugs are key risk factors for suicide¹⁻³ the interaction between lifetime substance misuse and misuse at death is less well documented. To develop and implement successful interventions for suicide prevention, it is important to know what role substance misuse and impaired reasoning and perception play, not only as integral to the life of an individual, but also at the time of considering and acting upon suicidal thoughts^{4,5}.

Illicit substance misuse is strongly associated with suicidal acts, even when the method does not involve drug overdose⁶. Moreover, dependent substance misusers record higher prevalences of all major risk factors for suicide than the general population⁶, in the forms of psychopathology, family dysfunction, social isolation, and lower socio-economic status⁷⁻⁹. One United Kingdom (UK) study¹⁰ indicates that drug overdose deaths amongst drug misusers feature frequent contacts with services in the months leading up to the deaths, along with a high incidence of suicidal ideation and previous suicide attempts. However this study was limited to drug overdose deaths alone, excluding hanging, which forms the majority of suicide deaths. Further to existing evidence on illicit drug misuse, combined alcohol and poly-drug use in recreational settings has become a cause for concern in recent years. In the US, it is estimated that 10% of the population are affected by alcohol or illicit drug use, with approximately 2% (3.2 million individuals) experiencing problematic poly-substance misuse¹¹.

The Adult Drinking Pattern survey reports that 23% of the Northern Ireland (NI) population drink more than the weekly sensible drinking limits (with 18% described as hazardous drinking and 5% as harmful - the latter equating to alcohol dependence). Of those adults who drink alcohol (74%), 30% engage in at least one binge-drinking episode per week¹². The NI Crime Survey 2008/9 reported a 3.8% prevalence for illegal drug use: here survey respondents had been asked if they had ever taken diazepam/Valium which was not prescribed by a doctor¹³. In contrast to the Drug Prevalence Survey findings which indicate higher use of sedatives and tranquillisers in women and older adults, the NICS shows that non-prescribed tranquilliser use was more common in men and younger age groups¹⁴. The Drug Misuse Database collects information on those presenting for treatment for their drug misuse (including those receiving services in prison). The latest report shows that 61% of drug users took two or more drugs. This proportion has been increasing again in recent years, up from 51% in 2009/10 when it was at its lowest¹⁵.

The UK-based Association for Young People's Health recently reported an increase in young people help-seeking for poly-drug misuse¹⁶. Alcohol and drug use (both prescription and illicit) play a significant part in suicide in Ireland¹⁷. A recent study detected drugs in 48% of cases of death by hanging with alcohol featuring in 55% of all suicides¹⁷. Missing from this analysis was any link to drug and alcohol misuse prior to the suicide event. Therefore, although the existing knowledge base provides a clear picture of the relevance of substance misuse to suicide deaths, there remains a lack of appropriate data linkage for closer examination of the relationship between drug and alcohol misuse in life and in death. Matching GP record data with standardised toxicology screening may support the development of interventions to prevent suicide.

Method

Data collection

We examined all deaths in Northern Ireland (NI) determined to be suicide by the NI Coroner Service (NICS) between 1st March 2007 and 28th February. Data collection was carried out between January and November 2011, initially from the Coroner Service for Northern Ireland (CSNI) and linked to associated data extracted from General Practitioner (GP) records. Two researchers extracted this data and a comprehensive database was established in SPSS. To ensure inter-rater reliability, ten CSNI files and ten GP records were initially examined by both researchers, followed by discussions to ensure that the variable label definitions were robust. Additional methodological details have been published elsewhere¹⁸.

Data preparation

Histories of help-seeking for substance misuse were extracted from the GP records. Because of the lack of standardisation in GP terminology classifying this information proved a challenge - for example terms included: history of alcohol abuse; alcohol dependency syndrome; heavy drinker; substance dependence; 'benzo addiction'; addicted to painkillers; opiate dependence, etcetera. While it was not possible to consistently classify substance misuse as either a current or historical issue, reference to relapse of historical substance abuse appeared frequently, though not in a systematic manner suitable for coding. For this analysis, both the alcohol and drug misuse data were (separately) summarised into two dichotomous variables noting any form of help-seeking for either alcohol misuse or substance misuse (prescription or illicit drugs). For this reason, the term substance misuse necessarily encompasses substance dependence throughout the paper.

Evidence of alcohol and substance misuse at the time of the suicide were obtained from the Pathology report in the Coroner records. Blood alcohol levels were dichotomised according to the drink-driving limit (>80mg per 100 ml). In line with the literature, this cut-off represents an accepted standard level defining impaired cognition and functioning⁴. Where blood toxicology screening was carried out, the pathology report listed any detected substances (either illicit or prescription drugs) with a note referring to whether or not the detected levels of prescription drugs fell within the "therapeutic range" - a value generated after accounting for the list of current medications prescribed to the individual by their GP. Using this, a dichotomous variable signifying drug misuse was generated with values: none detected; or non-therapeutic levels of prescription drugs or any level of illicit drugs detected.

Other variables included in the analysis were: presence of a mental health diagnosis; whether or not there had been previous suicide attempts; indication of a history of help-seeking for alcohol misuse; history of help-seeking for substance misuse (prescription and illegal drugs); treatment status at death; locale of residence (whether urban or rural); whether or not the individuals were prescribed drugs at the time of death; and method of suicide (hanging, overdose, other).

Fifty-four per cent of the deaths (218/403) were subject to drug toxicology screening. The Pathologist can use discretion in making any decision to order toxicology screening - this based on information obtained from the police, witness reports and evidence gathered from the scene (for example, whether the individual was known to misuse substances, or if prescription drugs were found). Procedurally, an additional factor in the decision to order a toxicology screening has been the time-lag for toxicology results to be provided by the laboratory. In England, Wales and Northern Ireland the decision is also "subject to the authority of the Coroner who may feel that such investigations may not be necessary to assist in the determination of the cause of death"¹⁹. Almost half the cohort was not subject to toxicology screening for substance misuse beyond alcohol, therefore we examined the characteristics of those who were subject to toxicology screening for substance misuse to explore the relationship between drug misuse in life and in death by suicide. It

is important to examine the differences between those who were screened and those who were not, to assess any patterns involved in the decision to screen, beyond the reported circumstances of the death.

Statistical analyses

Descriptive statistics are presented, including chi-square tests for significant differences between groups within the cohort (bivariate analyses). Significant variables were entered into a logistic regression model (multivariate analyses) to assess the relevance of individual characteristics to the decision to screen for misuse of substances at the time of death.

Ethical approval

Ethical approval for the study was obtained from The UK Office for Research Ethics Committees Northern Ireland (ORECNI), with access to personal confidential data in both the Coroners' records and the General Practitioners' records granted via the 'research exemption' within Section 33 of the Data Protection Act.

Results

Characteristics of the cohort

Individual characteristics of the two-year cohort (N=403) are described below. GP records were available for 90% (361/403). There were no significant differences by age or gender between those with available or missing GP records. Of the main cohort: males comprised 81% (325/403); age ranged between 11 and 83 years (with a mean of 39); 49% (196/403) were either married or cohabiting; 38% (155/403) were in paid employment; and 40% (161/403), 28% (111) and 32% (129) lived in urban, rural and intermediate areas respectively. In relation to health service access, 41% (148/361) had not been diagnosed with a mental health problem and 46% (167/361) were not in receipt of any secondary or tertiary health service treatment at the time of death. However, 82% (209/361) had consulted with the GP in the twelve months prior to the suicide, and of these 71% (209/296) had presented with mental health concerns. Overall, 50.4% (182/361) were in receipt of mental health related prescriptions and 50% (181/361) recorded more than six consultations, with a mean of 5.7 for the *help-seeking* group (296/361).

Table 1 about here

Table 1 records the levels of help-seeking for alcohol and drug misuse problems in the cohort for (a) the twelve months prior to the suicide (23.6%, 84/356) and 12.8%, 46/360 respectively, (b) and over the lifespan (33.4%, 120/359 and 22.2%, 80/360 respectively).

Blood alcohol reporting

All suicides – except a small number (four) where there was a significant time-lag between the suicide and either the death or the pathological examination of the body - were subject to blood alcohol examination. Overall, 51.6% (204/395) of the cohort tested positive for blood alcohol (with 93% of these recording levels >10mg per 100ml): of these 39.2% (155/395) were over the UK drink-driving limit (80mg/100ml); with 27.1% (107/395) at more than twice the UK limit. Of those *over the limit*, 36.1% (56/155) had sought help for an alcohol related problem in the twelve months prior to death. Table 2 records the relationship between help-seeking for alcohol problems over the lifetime and the presence of alcohol at the time of the suicide. Of those *over the limit* 47.1% (64/136) had

visited the GP for an alcohol related problem, while 52.9% (72/136) had never sought such help. Of those not *over the limit* 75.1% (166/221) recorded no history of help-seeking for alcohol misuse, while 24.9% (55/221) did. However, perhaps surprisingly, a smaller minority had sought help over concerns about alcohol misuse in the twelve months prior to death (10%; 22/221).

Table 2 about here

Toxicology reporting of prescription and illegal drug misuse

Table 3 records the relationship between toxicological screening for drugs misuse at the time of the suicide and help-seeking for drugs misuse over the lifetime: 37.6% (70/186) of those screened recorded positive results for drugs misuse at the time of death; and of these 65.7% (46/70) did not seek-help for drugs misuse over their lifetime, while 34.1% (24/70) did. This relationship is mirrored to a large extent amongst those who tested negative for misuse: 24.1% (26/116) and 75.9% (88/116) respectively for those who did and did not seek help.

Table 3 about here

Determinants of toxicology screening

Of the 403 suicide deaths, 54% (218/403) had been subject to blood toxicology testing. We found no differences in the likelihood of testing for gender, number of drugs prescribed, treatment status at death, mental health diagnosis, history of help-seeking for alcohol misuse, degree of rurality or prior suicide attempts. However, people with a recorded history of help-seeking for drug misuse (as reported by the GP), were more likely to be screened (χ^2 (1df, N = 360) = 11.5, $p = 0.01$), as were younger people. As age increased, toxicology screening was less frequently performed (χ^2 (3df, N = 403) = 28.6, $p < 0.01$). In addition, the method of suicide was associated with the likelihood of screening. As expected, overdoses and 'all other' methods were screened more often than hangings.

Table 4 about here

Table 4 records (for those with GP records) the Odds Ratios (ORs) associated with factors thought to influence post-suicide blood toxicology screening in the cohort: these include: gender, age, method of suicide and history of drug use. The pseudo R-Square value (Nagelkerke R-Square=0.21) indicates that the model is unlikely to explain more than 20% of the variance (e.g. toxicology screening carried out=yes, no). Death by drug overdose was the strongest predictor of blood toxicology screening (OR=13.73: $P < 0.01$, 95% CI=3.03-62.33). A history of drug abuse (OR=2.05: $p = 0.02$, CI=1.14-3.70) and age remained significant predictors: as age increased, the likelihood of toxicology screening dropped (Figure 3) – with those aged 65+ one tenth as likely to be screened when compared to those less than 25 years (OR=0.09: $P < 0.01$, CI=0.03-0.26).

Figure 1a and figure 1b about here

Amongst those cases for which a toxicology report was available, we examined the results of the screening to ascertain whether the chances of a positive result differed according to age. Almost two thirds (61.3%) of the tests were negative (that is, the quantity of drugs detected was within therapeutic range) with no significant difference across age. Figures 1a & 1b show that although age is a predictor of toxicology screening being carried out (suicide deaths are significantly less likely to be screened for blood toxicity, as age increases), it appears that there is no difference in the detection of misuse of prescription drugs or illegal drugs across age groups (χ^2 [6df, N = 218] = 3.08, $p = 0.80$).

Discussion

As part of a larger research initiative, this paper examines the relationship between substance misuse in life and misuse at death in a cohort of 403 suicides occurring over two years in Northern Ireland. This is the first time in a UK setting that primary care help-seeking data for life-time substance misuse has been linked to toxicology reports of substance misuse at the time of the suicide.

The frequency of substance misuse (of alcohol, prescription drugs and illicit substances) at suicide in this cohort reflects earlier research^{4,17}. Findings relating to alcohol showed a pattern of help-seeking in many of those who recorded significant alcohol levels at death. However, the relationship between substance misuse in life and misuse at death is not correlated to the degree that might have been expected. The overlap between histories of help-seeking and substance misuse is not simple: some of those with a history of substance misuse show no evidence of use at the time of death, and some with no history of help-seeking record positive results at death.

The negative blood results at the time of death amongst those with a history of help-seeking have implications for the frequently cited role of reduced inhibitions and impulsivity as mechanisms associated with substance misuse as a risk factor for suicide^{8,20–22}. Some mechanisms associated with substance misuse as a risk factor for suicide may remain even in periods of abstinence. Mediating factors such as personality traits, life events and comorbid (potentially undiagnosed) mental health problems are relevant, particularly where the substance misuse may have provided emotional regulation²². This requires further investigation. The positive toxicology results coupled with a history of associated help-seeking suggest that, despite help-seeking, there may be unmet need that could be addressed more effectively by services. Support services that can communicate, integrate and facilitate concurrent approaches to treatment of co-morbid mental health problems and substance misuse disorders would be an ambition worth pursuing.

Regarding those who had misused substances at the time of death, but had no history of help-seeking; a proportion will have selected misuse of available medications as an opportunistic method of choice for suicide²³, and may have no history of substance misuse; others may have accessed an alternative source of support or they may not have recognised their needs, therefore not yet sought help. Population based data suggests a significant time lag of 16 years (median) in seeking treatment for alcohol abuse in the Northern Ireland context²⁴.

The primary limitation of the data is that pathology results for use and misuse of prescription and illicit drugs at the time of death were only available for approximately half the cohort: no information was available for 46% of suicides occurring in NI. Compounding this limitation is the apparent bias in ordering blood toxicology analysis: while young people are over three times as likely to be screened for illicit substance misuse than those in middle-age (45–64 years), they are perhaps slightly less likely to have misused prescription or illicit drugs. A second limitation concerns the possibility that some of the cohort had experienced substance misuse problems but did not seek help from their GP (and therefore this ‘misuse’ will be lost to the current the analysis). This is likely to be particularly relevant to illicit drug misuse, due to associated criminality and fear of exposure or stigma²⁵. The analysis uses a binary classification for reported substance misuse where, for example, a trace of cannabis and a non-therapeutic level of prescribed medication are classified similarly, when in reality they are likely to produce different levels of impaired reasoning and perception. This classification means that we are unable to quantify the misuse or the impact it may have had on the

circumstances surrounding the death. However, assessing reasoning and perception, to include for example reduced inhibitions and impulsivity due to substance misuse, in a suicide cohort is confounded by not only poly drug use but also pre-existing mental health problems.

Two important points emerge from this study. Firstly, to capitalise on prevention programmes that address the role of alcohol and substance misuse in suicide it is important to better understand the mediating factors involved in substance misuse and suicide, including the role of impaired reasoning and perception at the time of a suicidal act. Secondly, this information must be considered in the context of existing concerns about prescription, alcohol and illicit drug misuse over a person's lifetime, in relation to intervening where suicidal thoughts are pervasive.

It is also important that the potential role of polypharmacy in suicide is explored and considered, particularly in relation to the psycho-active chemicals used in psychiatry, which affect the state of a person's emotional faculties at the time of a suicide attempt²⁶. In this cohort high levels of psychiatric polypharmacy were observed requiring further analyses. Such analyses would be enhanced by the availability of blood toxicology results for all suicide deaths. However, there are notable contextual difficulties and challenges that result in these limitations on the data that is available. In Ireland professional guidelines for Pathologists state that every death by suicide should be subject to toxicology screening¹⁷. There are no similar guidelines in the UK. Neither jurisdiction is subject to specific guidelines that would target the almost unlimited number of drug and poison analyses that could be carried out. Importantly, the Irish guidelines suggest that such analyses should be mandatory where the cause of death cannot be clearly established from the post mortem. Herein lies a fundamental difficulty in the use of coroners' data as a tool for developing interventions for the prevention of suicide.

The task of the Coroner is to determine cause of death. This is reflected in the increased frequency with which toxicology screening is ordered in the case of suspected overdose. In hangings (the method used in 76% of suicides in this cohort) the biological cause of death is asphyxiation, and within an exclusively medical approach to cause of death the associated socio-psychological context surrounding suicide may be diminished²⁷. For example, despite expectations to the contrary, a prior suicide attempt (particularly drugs overdose) did not independently predict the ordering of a toxicology report. Thus, previous behavioural actions related to intent to die do not feature in the decision to order toxicology screening because they are largely irrelevant to the cause of death. As a result of this procedural convention, the full extent of substance misuse in the psycho-social sequelae of suicide remains unknown. To make best use of the information collected when a suicide occurs, a sea change in medical forensics may be required, to re-align the process towards a bio-psycho-social model for examining and understanding suicide.

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Tables and Figures

Table 1 History of substance misuse help-seeking at GP (n=360)

Lifetime history of alcohol misuse help-seeking		
	n	%
Yes	120	33.4
No	239	66.6
Lifetime history of drug misuse help-seeking		
	n	%
Yes	80	22.2
No	280	77.8
Last 12 months help-seeking for alcohol misuse		
	n	%
Yes	84	23.4
No	272	75.8
Last 12 months help-seeking for drug misuse		
	n	%
Yes	46	12.8
No	314	87.2

	<p>Table 2. Suicides in Northern Ireland (March 2007 – February 2009): Blood alcohol levels at the time of death, linked to lifetime help-seeking for alcohol misuse.</p> <p>Results record proportions (plus number/population).</p>			
Source: Coroner's Files	Total number of suicides	403		
	Number with recorded blood alcohol analysis	395		
	Blood alcohol level by UK drink-driving limit: (>80mg per 100 ml)	Under limit (<80) 61.5% (243/395)	Over limit (>80) 38.5% (152/395)	
Source: GP records	Number linked to General Practice (GP) records	NO 22	YES 221	NO 16 YES 136
	For those with GP record:	Over the limit (>80)		
	Lifetime help-seeking for alcohol misuse (%):	No		Yes
	No	75.1% (166/221)		52.9% (72/136)
	Yes	24.9% (55/221)		47.1% (64/136)

	Table 3. Suicides in Northern Ireland (March 2007 – February 2009): toxicology screening* at the time of death, linked to lifetime help-seeking for drugs misuse.		
	Results record proportions (plus number/population).		
Source: Coroner's Files and GP Records	Total number of suicides	403	
	Number subject to blood toxicology analyses	218	
	Number linked to General Practice (GP) record	186	
	Misuse of drugs at the time of the suicide	no 62.4% (116/186)	yes 37.6% (70/186)
	For those with GP record:	Toxicology: misuse at time of death	
	Lifetime help-seeking related to drugs misuse (%):	no	yes
	no	75.9% (88/116)	65.7% (46/70)
	yes	24.1% (28/116)	34.3% (24/70)

*: a positive toxicology result is characterised either by the detection of (a) illicit substances, or (b) the presence of prescribed substances used over and above the prescribed therapeutic level.

Table 4 Logistic regression model predicting the odds of a toxicology report being carried out (n=360)

Variables in the model (Pseudo R ² =0.21)					
		Odds ratio	P value	Sig	95% CI
Gender	Male	1.00			
	Female	1.34	0.33		0.74-2.41
Age	<25	1.00			
	26-44	0.28	<0.01	**	0.14-0.55
	45-64	0.16	<0.01	**	0.08-0.33
	>65	0.09	<0.01	**	0.03-0.26
Drug abuse	No record by GP	1.00			
	Record of drug misuse	2.05	0.016	*	1.14-3.70
Method	Hanging	1.00			
	Overdose	13.73	<0.01	**	3.03-62.33
	Other	1.83	0.05		0.99-3.35
**=significant to p<0.01; *=significant to p<0.05					

Figure 1 a Likelihood of toxicology results being requested by Age

Figure 1 b Detection of substance misuse at time of death by Age

